

What is claimed is:

1. An illumination optical system comprising:
  - an afocal beam expander system which expands a beam illuminated from a laser light source;
  - a linear beam-forming lens system having at least refractive power in a second direction which is substantially at a right angle to at least a first direction, the linear beam-forming lens system converting the beam, illuminated from said beam expander system, to a linear beam having its long side in the first direction;
  - a lens array section having a plurality of element lenses, arranged along said first direction; and
  - a condenser optical system which illuminates a processed face by reconnecting images of said linear beam from each of said element lenses thereon.
2. An illumination optical system according to claim 1, wherein the linear beam-forming lens system comprising a cylindrical lens having refractive power in said second direction.
3. An illumination optical system according to claim 2, wherein at least one of said cylindrical lens, said lens array section, and said condenser optical system being movable along an optical axis.
4. An illumination optical system according to claim 1, wherein said lens array

section has at least a first sub array section and a second sub array section, said element lenses are rotationally symmetrical, and said first sub array section and said second sub array section are arranged so that optical axes of said element lenses corresponding to the sub array sections substantially match each other.

5. An illumination optical system according to claim 1, said condenser optical system comprising, on the side of said processed face, another cylindrical lens having refractive power in said second direction .

6. A laser processor comprising:  
a laser light source which supplies laser light;  
the illumination optical system as described in one of Claims 1 to 5; and  
a scanning-moving section which moves the linear beam on said processed face and said processed face in relation to each other.

7. An illumination optical system comprising:  
a prism member which splits a beam, illuminated from a laser light source, into a plurality of light beams in a first direction and reconnects the plurality of light beams on a predetermined face;  
a linear beam-forming lens system having at least refractive power in a second direction which is substantially at a right angle to said first direction, the linear beam-forming lens system converting said plurality of split light beams to a linear beam having its long side in said first direction; and  
an expanding optical system which expands said linear beam in said first direction.

and illuminates it onto a processed face.

8. An illumination optical system according to claim 7, wherein the prism member comprises a trapezoid prism, and the position of said predetermined face, where said plurality of light beams which were split by said trapezoid prism are connected, substantially matches the focal positions of said linear beam-forming lens system in said second direction.

9. The illumination optical system according to claim 7, wherein the expanding optical system comprising an optical system which is rotationally symmetrical to an optical axis.

10. The illumination optical system according to claim 7, wherein linear beam-forming lens system comprising a first cylindrical lens having refractive power in said second direction.

11. An illumination optical system according to claim 7, said expanding optical system comprising, on the side of said processed face, a second cylindrical lens having refractive power in said second direction.

12. An illumination optical system according to claim 11, at least one of said first cylindrical lens and said second cylindrical lens being movable along an optical axis.

13. The illumination optical system according to claim 7, further comprising a beam

expander system which expands the diameter of the beam, illuminated from said laser light source, more greatly in said first direction than in second direction.

14. A laser processor comprising:

the illumination optical system according to one of Claims 7 to 13;  
and a scanning-moving section which moves the linear beam on said processed face and said processed face in relation to each other.